KNOWLEDGE

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S STAMPS (part one)

THE use of stamps and the hobby of stamp-collecting only began in the 19th century. But the postal service began much earlier than this.

As soon as man learned to reproduce his thoughts by means of written symbols he was in a position to send messages to people far away. Some historians maintain that as long ago as 3000 B C there was a postal service in China. But the real founders of a regular postal service were the Persians; under them correspondence was carried by messengers on horseback.

The postal services introduced by the Ancient Greeks and Romans were similar to that of the Persians.

The Emperor Augustus (1st century B C) instituted a highly organised postal service throughout the territories of the Roman Empire; he built 'postal stations' at distances of five or six miles from each other on all the principal roads. At these stations messengers could change their mounts, and so it became possible to send messages speedily from Rome to the provinces of the Empire and back again.

Chinese letter carrier (from a 16th-century painting)

It must be made clear that these early postal services were only for governmental use. Private citizens who wished to send messages had to rely on personal messengers or travelling traders.

The first public service

All through the Middle Ages, the postal service continued to be used exclusively by the government. In the 11th century a new method was devised, a regular postal service using carrier pigeons.

The first postal service designed for public use was started in 1516 by the Italian Prince Francesco Tasso (de Tassis), who lived at the court of the German Emperor Maximilian I, and began the new service to Vienna in Austria from Brussels in Belgium.

Carriage used during the Roman Empire for the transport of correspondence

Two centuries later, members of the de Tassis family were managing the posts throughout the whole of Europe. It was about this time that messengers were replaced by postillions (so called because they drove the horses on the postal coach). The distance they travelled between the stations where they could change their horses came to be called a 'post'.

Prince Francesco de Tassis

Early charges

How was the post paid for? There were considerable differences in postal rates, not only between different states but between different regions. These were always fairly heavy, and the proprietors were able to make a lot of money from their postal services. In every postal service the charge for the carrying of letters was collected from the person to whom the letter was addressed, and not from the sender, as it is today.

Embossed paper

In 1607 the Company of Mail Carriers of the Venetian Republic had special sheets of paper printed for letters; they bore the Lion of Saint Mark, and the Republic of Venice forced all letter-writers to use such sheets. Two centuries later, Sardinia made a similar move. From 1818 on, the King, Victor Emmanuel I, had letter-sheets embossed with seals; the embossed stamps on the sheets were of different values, depending on the distance to their destination. They showed a horse galloping, and in the saddle a little boy sounding his horn; for this reason these embossed stamps came to be known as 'Little Sardinian Horses'.

Mailcoach with the postillion riding on one of its horses

The 'Little Sardinian Horses' impressed (as tax stamps) on the letter-sheets of the Kingdom of Sardinia (1818)

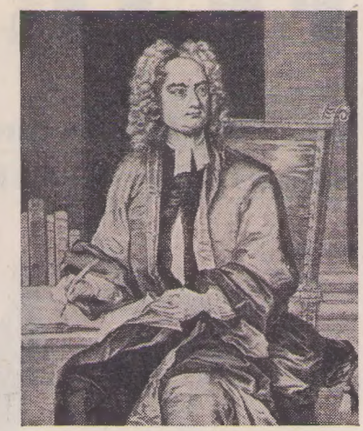
Previous page: Some of the world's interesting and valuable stamps

KNOWLEDGE NEWS

Week beginning 14th July 1963

David Frost – 'Mr Satire'

FOCUS ON SATIRE



Jonathan Swift – a bitter satirist

Millicent Martin – satirical squawks

Juvenal – one of the first

'A wave of malicious satire is raging on the banks of the Thames. British society is undergoing a moral and ideological crisis. . . . Today traditions are being shaken and conventions trampled underfoot. In the theatres, in the press, and even on radio and television, mockery is made of everything and everybody.'

William Rushton – a jovial satirist

Dryden – a great political satirist

THE disapproving lines quoted above appeared in a Russian newspaper – *Pravda*. But the attitude in Britain towards satire is by no means disapproving. The new craze for this type of humour, which makes fun of people and institutions by exaggerating their faults, has swept Britain. And Britain's present satirists have almost overnight joined the ranks of the top money-earners in show business.

They are the new affluent ones, unknown and struggling one day, the surtax payers the next.

There are many people, of course, who think that lampooning the Prime Minister before the eyes of the television masses is overdoing things a bit. But although there are many of these people, they are very much in the minority.

The success and controversy surrounding the BBC's *That Was The Week That Was* programme showed that, on the whole, satire is welcome in the home.

And just look at what has happened to the people involved in the off-beat world of satirical humour.

Take David Frost, the clergyman's son with the curious haircut – he has rocketed from a £40-a-week job as a script-writer to earnings of around £250 a week from the BBC alone. He also obtains a handsome income from appearing in cabaret, writing newspaper articles, and the seaside summer show he is doing right now.

Jonathan Miller, star and author of the satirical show *Beyond the Fringe*, at present running on Broadway in the United States, is one of the most successful of them all. He earns more than £500 a week, but he cannot afford to come home from America for another year. If he did he would have to pay £12,000 in income tax.

On the female side Millicent Martin is probably the best known. Her squawky voice and almost incomprehensible songs are very popular with the *That Was The Week That Was* audiences. She is also doing a summer show, and has been booked for a film for which she is being paid, it is said, £25,000.

William Rushton, the tubby TWTWTW man, has been asked to do films and cabaret; he is also writing a newspaper column.

And so it goes on. The financial fruits of acid wit are indeed plentiful

THAT WAS THE SATIRE THAT WAS

SATIRE, unlike sick humour, is not an invention of the 20th century. Juvenal (A D 60–140) was one of the greatest satirists of all. The best-known English satirist is Dean Swift (1667–1745), who wrote *Gulliver's Travels*, in which he bitterly ridiculed his times. Before this John Dryden (1631–1700) had written *Absalom and Achitophel*, which has been called the greatest political satire ever written. In the 19th century, Samuel Butler (1835–1902) provided a gentler form of satire in his book *Erehwon* ('nowhere' spelt backwards). In it he satirised, among other things, the mechanical age, and the Church of England, which he likened to financial banks with music playing in them.

Can the present crop of satirists rank with these demi-gods of satire? They are certainly as outspoken. Pillars of the Establishment like the Duke of Norfolk, Earl Marshal of England, are frequently shaken.

In the last century, when a complete amateur was made First Lord of the Admiralty, those great satirists Gilbert and Sullivan wrote *HMS Pinafore*. One of the songs told how someone polished all the door knobs of the Admiralty so 'carefully' that he became 'ruler of the Queen's Navy'. When the Duke of Norfolk became manager of the MCC, TWTWTW made William Rushton, dressed up as the Duke of Norfolk, sing: 'I rode so hard in the cavalry That I became the manager of the MCC'. Not even great achievements are treated with respect. Sir John Hunt gave his reason for climbing Everest as 'because it is there'. TWTWTW had a picture of a sterling English gentleman climbing a lamp-post. When asked by a policeman why he did it he replied . . . well, you can guess what!

Ridiculing people and institutions can be a healthy sign, but it can also do a lot of harm – our present satirists do not always seem to be able to distinguish between what is good and what is bad.

The Duke of Norfolk – a pillar shaken

Letter from the Editor-in-Chief

37 HERTFORD ST.
LONDON W.1

I AM looking very brown and feel extremely healthy, as I have just come back from a holiday. Actually this year I have been very lucky as far as getting the sun is concerned. Recently I went On Safari with my friend Armand Denis, who, you will remember, is Editor-in-Chief of our magazine *Animals*.

We slept in the open, which to me was a very exciting experience. The African night is full of mysterious noises and cries.

I was also in Australia with Armand Denis. Both of us greatly enjoyed this, especially when we had koalas climbing all over us. I cannot see how anyone wants to shoot these lovable animals – but millions have been shot for sport. My favourite Australian animal was the extraordinary duck-billed platypus.

Anyway, in the next few weeks I am going to tell you a lot more about my journeyings in the last few months – and I hope you will often write to me and tell me about your holidays too.

I am glad to hear that a steady stream of applications for the Wildlife Youth Service is coming in from *Knowledge* readers. Full details were in *Knowledge News* last week, and I hope you will take this opportunity to join.

News about binders

This week Black *Knowledge* readers come to the end of Volume 11 (Nos. 121–132). In the centre of *Knowledge* this week they will find the title page and table of contents for Volume 12 (Nos. 133–144). The standard binder for Volume 12 is available now.

John Chancellor

FACTORS

A word game

The following statements are either 'true' or 'false'. When one is 'true' score the *first* number, but if you think that it is 'false' score the *second* number. Change the numbers into letters (1=A; 2=B; and so on). Put these letters into the squares to make a five-letter word reading down the frame.

A young hare is called a leveret (3) – (2)

The Pilgrim Fathers sailed in the Mayflower in 1720 (12) – (8)

Nome is in Alaska (1) – (5)

Caliban was Prospero's slave (18) – (14)

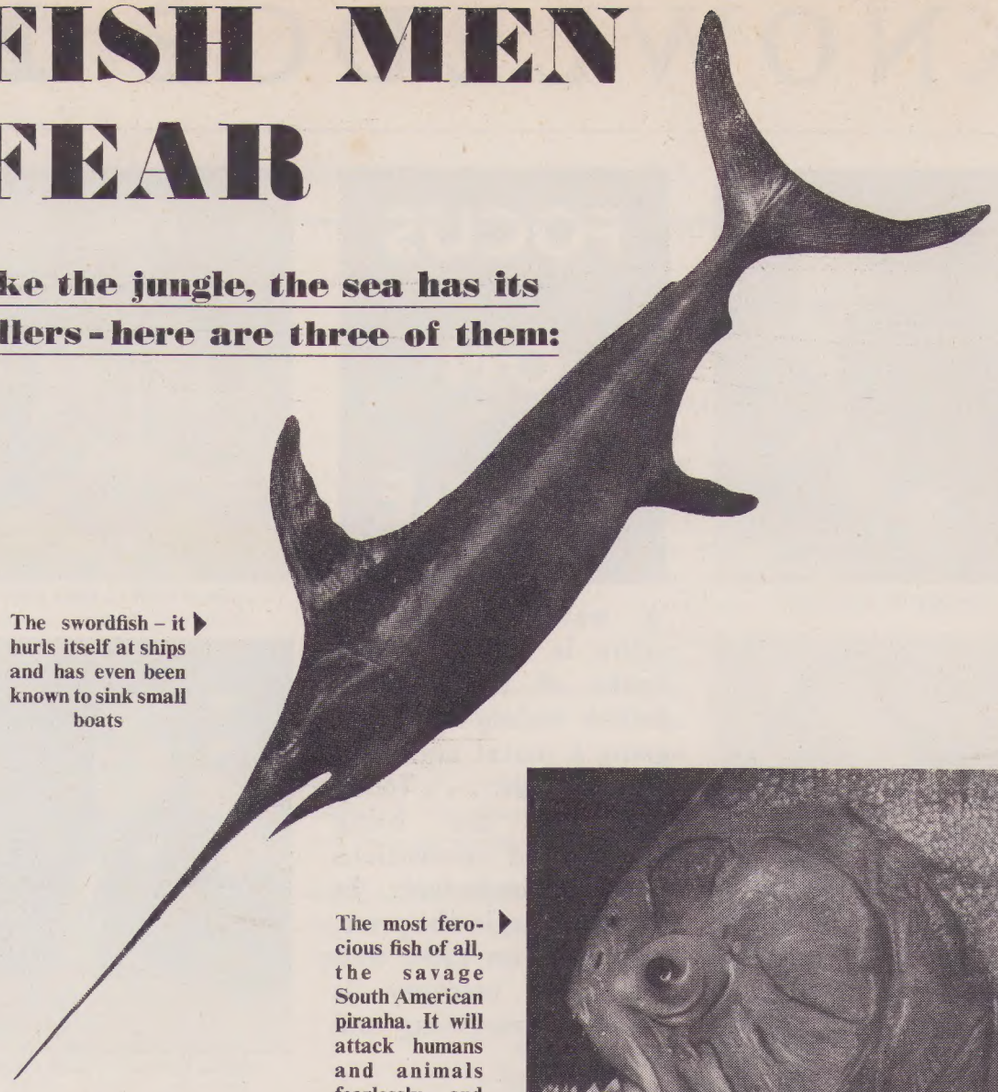
The surname of the Archbishop of Canterbury is Fisher (4) – (20)

ANSWER

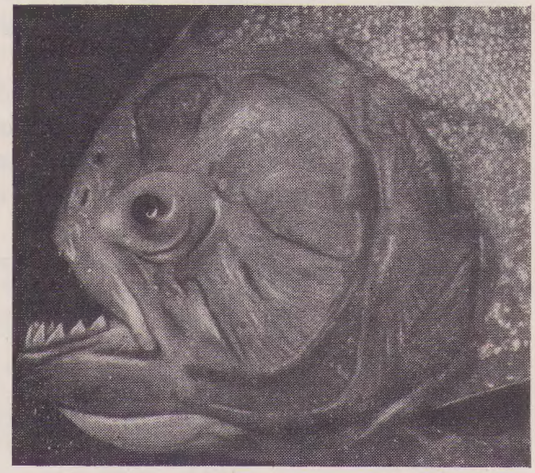
Chart
(*The Pilgrim Fathers sailed in 1620 and Dr Ramsey is the Archbishop of Canterbury.*)

FISH MEN FEAR

Like the jungle, the sea has its killers – here are three of them:



The swordfish – it hurls itself at ships and has even been known to sink small boats



The most ferocious fish of all, the savage South American piranha. It will attack humans and animals fearlessly and even cattle which are standing in the shallows of the river

THERE are few fish as terrifying as the sawfish. This ferocious creature can grow to a length of nearly 30 feet, and its terrible 'saw' can inflict savage wounds even on such formidable enemies as whales, which it attacks fearlessly. If it sees a whale it will lacerate it with its jagged weapon, and swim alongside the helpless animal, feeding off the open wound.

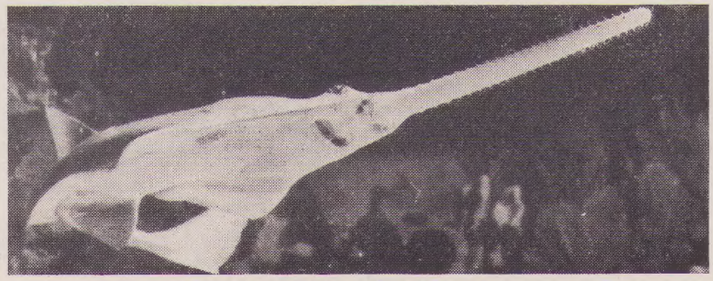
But its usual prey is smaller fish. It will swim right into the midst of a shoal, wreaking havoc with the vicious thrashes of its 'saw'. Then it will swim back to feed at leisure on the dead and dying fish it has left in its wake.

Sometimes sawfish will swim up fresh-water rivers and attack human swimmers. There are reports that men have been completely cut in two by the deadly 'saw', and in parts of India the appearance of a sawfish is a constant and frightening menace.

The swordfish, too, is a killer. The 'sword' is smooth and round, whereas the 'saw' of a sawfish is flat and jagged. But both are powerful weapons of attack. Sometimes a swordfish will mistake a boat for a whale and hurl itself at the craft with such fantastic force and velocity that the sword is buried well over a foot deep in the wood – often too deeply to withdraw. Imagine the force of the blow which penetrates solid wood a foot or more in depth! In the British Museum there is a piece of ship's timber in which a swordfish plunged its 'sword' to a depth of 22 inches! Small craft have even been sunk by such attacks, and men, too, have suffered at the hands, or rather swords, of swordfish. In 1830 a man was killed by a swordfish off the coast of England, but fortunately you are highly unlikely to encounter one on your next trip to the seaside!

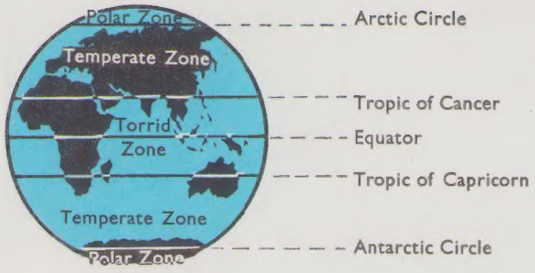
In the blood-soaked waters near the riverside canning factories along the Amazon lurk the most terrible fish of all – piranha. These carnivorous fish assemble in enormous shoals to devour the carcasses and bones jettisoned from the factories. They are completely insatiable. An animal which falls into the water will be ripped to shreds in a matter of seconds. Once a Brazilian native fell off his boat into the water but managed to grasp the side of the boat with his fingertips. He was quickly helped out – but he was dead, stripped clean to the skeleton from the waist down.

These aggressive fish will attack anything with their unnaturally large and razor-sharp teeth. They will tear a wooden plank to ribbons, and when there is nothing else they will turn cannibal and devour each other with the same seemingly wicked pleasure.



Perhaps the most grotesque of all killer fish – the sawfish

CLIMATIC ZONES



Map showing the traditional subdivision of the five climatic zones of the world

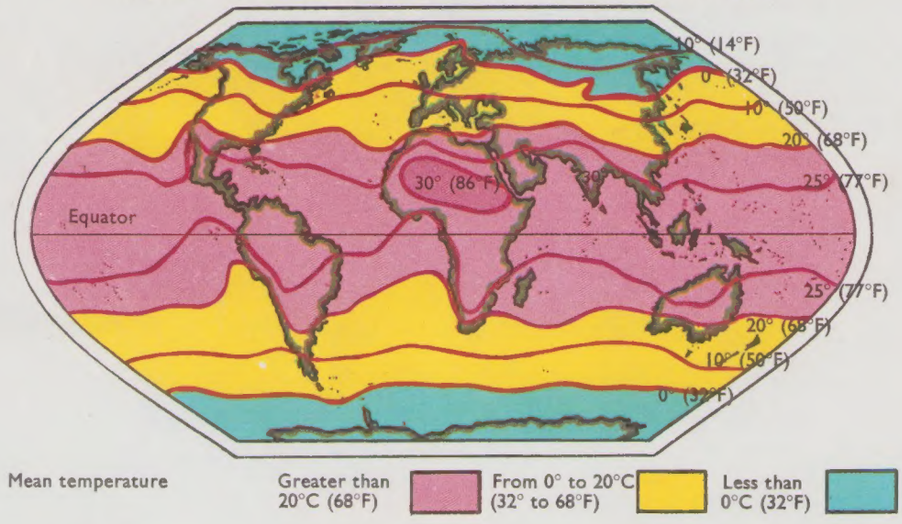
TRADITIONALLY the climate of the world was divided into five zones corresponding to latitude. The illustration above shows how the world was divided into two zones of polar climate (lying to the north of the Arctic Circle and south of the Antarctic Circle respectively); two temperate zones (lying between the polar circles and the Tropics); and a torrid zone (situated between the Tropics). This system of classification is based upon the suppositions that climate is governed by temperature, and that the distribution of temperature is wholly controlled by latitude. Both of these ideas are oversimplified.

We have seen (page 1468) that climate is composed of a number of different elements: temperature, humidity, rainfall, wind velocity, cloudiness, duration of sunshine, and so on. In any classification of climate these elements must be taken into account. We have also seen that there are factors other than latitude which influence temperature. These include distance from the sea, height above sea level, and the warming or cooling effects of ocean currents.

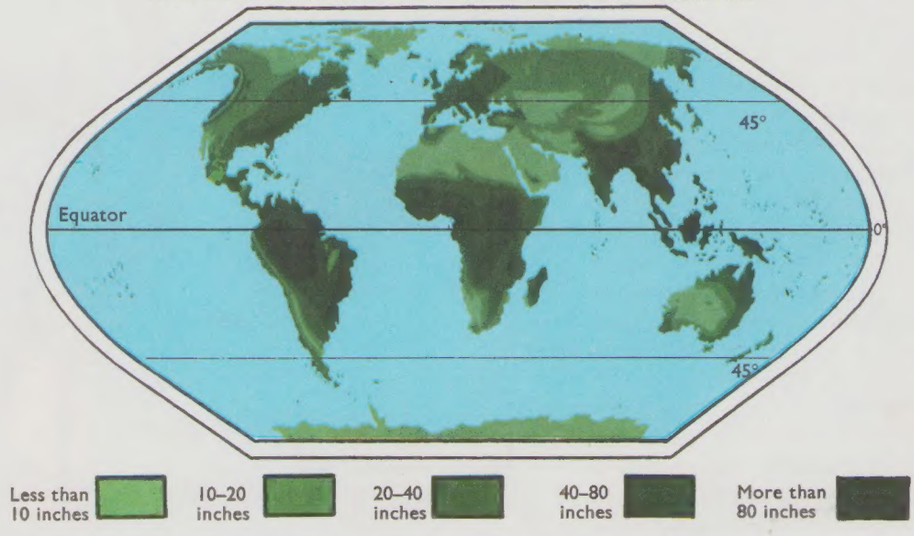
The total amount of rain which falls during the year is clearly an important climatic element, particularly because of the control which this exerts over plant growth, and therefore over the life of animals and man. At one extreme there are desert climates, where rain is rare and plants cannot grow. In contrast to these there are places near the Equator where rainfall is abundant throughout the year and plant growth is luxuriant.

We must also consider the effect of seasonal rainfall. If the greatest rainfall comes in summer, the increased cloudiness will lower the summer temperatures and there will be plenty of moisture to assist plant growth. If, on the other hand, the wettest season is winter, the rain will have fallen outside the growing season and the spring and summer crops will suffer.

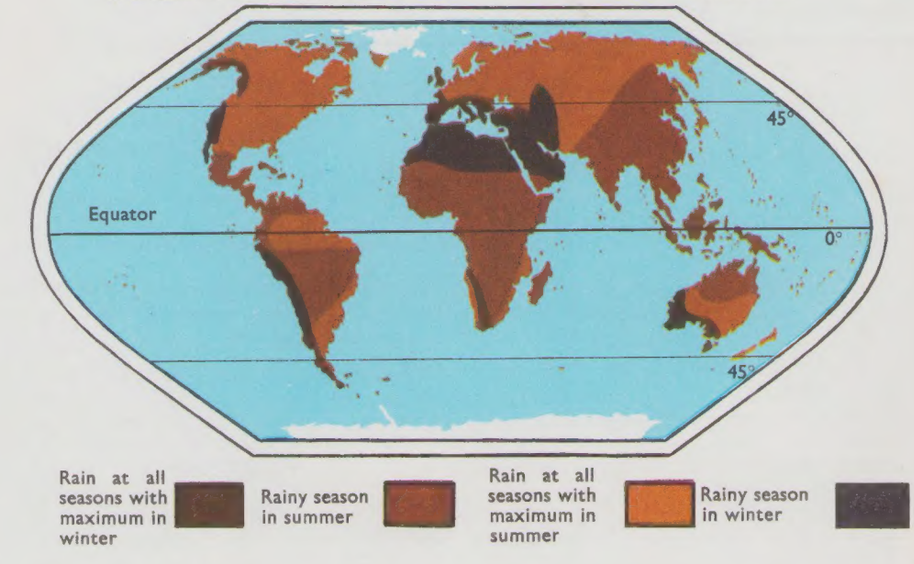
WORLD MAP SHOWING MEAN ANNUAL TEMPERATURE



WORLD MAP SHOWING TOTAL ANNUAL RAINFALL



WORLD MAP SHOWING SEASONAL INCIDENCE OF RAINFALL

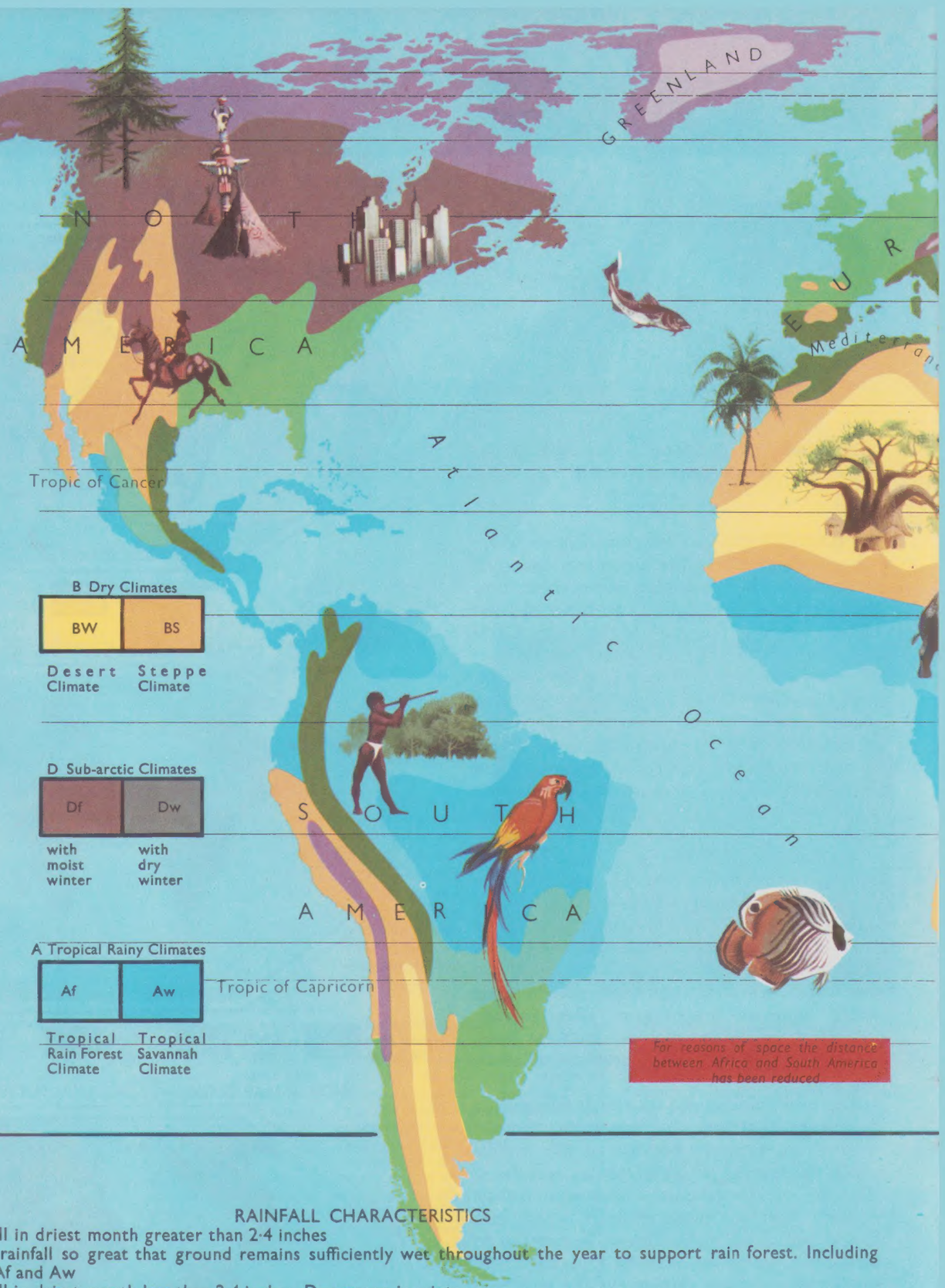


KÖPPEN'S CLASSIFICATION OF WORLD CLIMATES

One of the most useful systems of climatic classification is the one originally proposed by the Austrian scientist, W. Köppen, nearly 40 years ago.

His method was partly based upon annual and monthly averages of temperature and of rainfall; partly on the times of occurrence of the wet and dry seasons; and partly on the temperature range between the hottest and coldest months. Using this system, the climate of any place for which meteorological observations are available can be described by means of a series of letters.

Köppen's classification is fairly simple, and this accounts for its lasting popularity. It does, however, contain a number of arbitrary climatic boundaries which are difficult to recognise in nature. For example, the map shows that the climate of India may be divided between type 'A' (tropical and rainy) and type 'C' (warm temperate and rainy). However, this line does not correspond to any geographical distinctions which can be made on the basis of natural vegetation, agriculture, or human occupation of the land. American geographers often criticise the Köppen system because the whole of the Pacific coastal zone from Vancouver to southern California is similarly classified as 'Cs' or 'Mediterranean Climate', while there are, in fact, distinct differences within this zone.



CLIMATE	RAINFALL CHARACTERISTICS
A Tropical rainy climates	Rainfall in driest month greater than 2·4 inches Total rainfall so great that ground remains sufficiently wet throughout the year to support rain forest. Including both Af and Aw Rainfall in driest month less than 2·4 inches. Dry season in winter
B Dry climates	The definition of desert and steppe climates depends not only upon the total amount of rainfall but also upon the season during which most of this falls. Summer rainfall will evaporate more quickly than winter rainfall and will therefore have less effect upon plant growth
C Warm temperate rainy climates	Cf No distinct dry season. Driest month has more than 1·2 inches rainfall Cw Winter dry; at least 10 times as much rain in the wettest month as in the driest Cs Mediterranean climate: summer dry; at least three times as much rain in the wettest month as in the driest
D Sub-Arctic or cold temperate climates	Df Cold climate with humid winters Dw Cold climate with dry winters
E and F Polar climates	

TEMPERATURE CHARACTERISTICS

Af Tropical rain forest climate; no dry season. Temperature of coolest months above 64·4°F (18°C)

Am Short dry season

Aw Tropical savannah climate with distinct dry season

BW Desert climate

BS Steppe climate

Average temperature of coldest month greater than 26·6°F (–3°C); average temperature of warmest month over 50°F (10°C)

Average temperature of coldest month below 26·6°F average temperature of warmest month above 50°F

ET Tundra climate. Average temperature of warmest month below 50°F but above 32°F (0°C)

EF Perpetual frost climate. Average temperature of all months below 32°F

TYPICAL LOCALITIES

Amazon Basin, Congo, Cameroons, Malaya
India (Malabar Coast), Burma (Arakan Coast)
Central India, Burma, Thailand, southern Brazil, East Africa

Hot deserts (average annual temperature exceeds 64·4°F, 18°C): Sahara, Kalahari, Atacama Desert, North American Deserts, Great Australian Desert
Cold deserts (average annual temperature is less than 64·4°F, 18°C): Gobi, Patagonia
Central Asia, Iran, Iraq, Rhodesias, fringes of Sahara, Kalahari, and Great Australian Deserts

Western Europe, Great Britain, eastern United States, southern Chile, Japan
Typical monsoon climate of areas where temperatures are less than those of type A. China, northern India, Ethiopia
Mediterranean countries, including parts of the Middle East and North Africa, Cape of Good Hope, south-west Australia, central Chile, Pacific coast of North America

Norway, Sweden, Finland, Russia and Siberia, northern United States, and Canada
Characteristic of north-east Asia, such as eastern Siberia, northern China

Northern parts of Siberia and Canada, coastal districts of Greenland, Svalbard, and other Arctic and Sub-Antarctic islands (pages 1134 and 1144). Mountains beneath the snow line.
Antarctica, Greenland, and interior of most Arctic and Antarctic islands, such as Spitsbergen, Baffin Island and Novaya Zemlya. High mountains above the snow line in all continents

MEROVINGIANS, CAROLINGIANS, AND CAPETIANS

FIVE dynasties have ruled France from the coming of the Franks to the ending of the French monarchy in the mid-19th century: the Merovingians, Carolingians, Capetians, Valois, and Bourbons. The last three dynasties were all descended from one man, Hugh Capet. The first three had no common ancestor but were separate families; between them they ruled France for nearly 900 years.

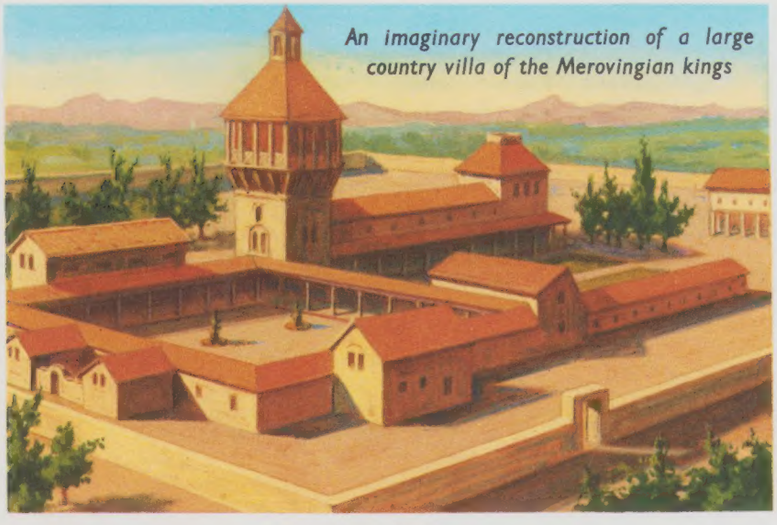
A Merovingian soldier

The Merovingians (about A D 448 to 751)

In the time of the Roman Empire, Gaul was a very rich province. In the 4th and 5th centuries it was overrun, with the rest of the Western Roman Empire, by hordes of barbarians, mostly of Germanic stock. Some of these peoples, like the Visigoths, swept through Gaul and then went on to settle elsewhere, but others made their home in Gaul itself. The most important of these peoples were the Franks. They spread into Gaul in the 5th century from the area of the lower Rhine, and by the end of that century they not only controlled most of Gaul but had caused the province to be known as *Frankia*, from which the name France is derived.

The first Frankish ruler to have the title of king was Merovech, about whom we know very little. The probable dates of his reign are 448 to 457, and his descendants were known as Merovingians. The greatest of them was Clodovech – or Clovis (480-511), as he was later known (the name is really the same as *Louis*).

Clovis spent most of his reign in fighting, his aim being to control the whole of France as far as the Pyrenees. In this he nearly succeeded. But his religious conversion was as important for the future of his people as his military success.



An imaginary reconstruction of a large country villa of the Merovingian kings

The traditional date for his conversion is 496, when it is said he was baptised a Christian by St Remigius, the Archbishop of Rheims. He was converted not, as were most of the other Germanic peoples, to the Arian Christianity (a creed in which it was believed that the Father was greater than the Son), but to the orthodox Christianity of Rome. This meant that the Franks could easily become the allies of the Papacy, and it was this which was later to bring them further extraordinary conquests.

St Remigius, Archbishop of Rheims, who baptised Clovis after his conversion

Clovis was by far the greatest of the Merovingians. Those who followed him were generally weak and ineffective; they were called the *rois faineants* or do-nothing kings. One of the main causes of their weakness was the Frankish custom of dividing the inheritance of a dead man. Primogeniture (as the practice of giving all the inheritance to the first-born heir is called) was not practised among the Franks. This meant that the death of a king was often followed by large-scale anarchy while the sons and relations wrestled for the spoils. In these conditions it is not surprising that as kings got weaker, their hereditary chief ministers, the Mayors of the Palace, grew stronger. It was one of these Mayors of the Palace, Pepin the Short, who in 751 put the last Merovingian in a monastery and took over the throne.

The Carolingians (from A D 751 to 987)

The Carolingian line obtained its name from its most famous member, Charles the Great. For many years before Charles's father, Pepin the Short, seized the throne from the Merovingians, his family had been the real power in the kingdom. One of them, Charles Martel (see page 449), had in 732 thrown back the Arabs from southern France at the great battle of Poitiers.

Pepin the Short (751–768) gave a display of his power soon after coming to the throne. He was the first Frankish ruler to interfere with Italy. He marched there to support the Pope against the Lombards in 754. Charlemagne (Charles the Great; see page 42) ruled from 768 to 814, at first jointly with his brother Carloman, for the inheritance had still to be divided. In 771 Carloman died.

A Carolingian soldier

Charlemagne, by a rapid series of conquests all over western Europe, soon became its dominant figure. In 800 he reaped the full fruits of Clovis's conversion to Roman Christianity when he was crowned *Emperor of the Romans* by Pope Leo III. He declared that he had indeed refounded the ancient Roman Empire, and certainly western Europe had not seen so powerful a ruler since the fall of Rome. Nor until the time of Napoleon was so much western territory controlled by one man.

Charlemagne was a great warrior and a great leader of men. His administration was not so successful. It was not always easy to control his local officers (*missi dominici*) in the far-flung corners of his empire. He tried to ensure that the churchmen and his civil service were educated at least to the point of being able to read and write – and he gallantly struggled to acquire these arts himself. But his vast empire depended on his personality to hold it together. His son, Louis the Pious (814–840), did not have his personality, and the empire was rent by the rivalry of the Carolingian family. In 843, at Verdun, three of Louis's sons agreed to divide the empire between them. Charles the Bald (840–877) kept the *Kingdom of the West Franks* (France); Louis, the *Kingdom of the East Franks* (roughly what is Western Germany today); the third son, Lothair, kept the area in between, the *Middle Kingdom*, which included parts of present-day Alsace, Lorraine (originally Lothairingia), Burgundy, and north Italy. He was also given the rather empty title of Emperor. In none of these kingdoms did the descendants of the great Charles succeed in preserving their power. Each kingdom tended to split up into powerful duchies. The Middle Kingdom soon disappeared altogether, and it was the king of the East Franks who then assumed the imperial title. And on top of all this, Viking invasions made the difficulties of ruling immeasurably greater.

Charlemagne (768–814) *Lothair* (843–855)

The three greatest representatives of the Capetian dynasty; from the left: Philip II (Augustus), Louis IX (St Louis), Philip IV (the Fair)

THE CAPETIANS (987–1328)

It was not until 987 that the rule of the last Carolingian (Louis V) ended in France, but just as the Carolingians had once controlled the Merovingians, they in their turn fell under the influence of another great family. The first member of this family (who were hereditary Counts of Paris) to become king was Hugh Capet, but when he took over the throne in 987, his rule was little more than nominal outside the area round Paris itself (the area is now called the *Ile de France*). It was the great dukes and counts who ruled the rest of France. Duchies like Aquitaine were virtually independent. It was the policy of the Capetian kings, during the centuries which followed, to bring all France under the control of the crown. It was no easy task, and it involved long, tedious, and expensive conflicts, not only with their more powerful subjects, but with the kings of England, who, from 1066 onwards, had great lands and interests in France. Philip I (1060–1108) did little to increase royal power, but Louis VI (1108–1137) laid the foundation of Capetian greatness by extending royal territory and influence.

Three Capetian rulers stand out from the rest.

Philip II (Augustus) (1180–1223) greatly added to French territory (see pages 499 and 960). His son, *Louis IX* (St Louis) (1226–1270) was the most powerful and respected monarch of his time (see page 1124). *Philip IV* (The Fair) (1285–1314) was extremely unscrupulous but very successful. He was continually at war, and his consequent taxation demands were heavier than those of any previous French king.

LATER DYNASTIES

When Philip's son, Charles IV, died in 1328, there was no Capetian left to inherit the throne. The crown then passed to a younger branch of the same family – the Valois. It was a later branch of the Valois who started the line of the Bourbons.

A knight in armour at the time of Philip the Fair

MAMMALS' TEETH

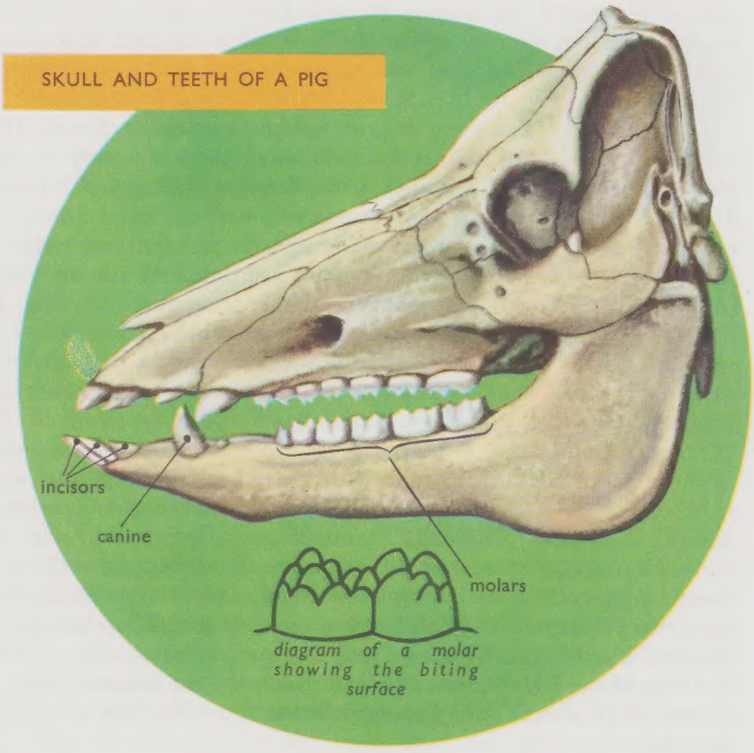
'SHOW me your teeth and I will tell you what you eat.' This is a principle which can be applied very widely in the study of animals.

. Teeth are very hard structures composed of dentine and enamel (see pages 80 and 1104) which grow out of the bone of the jaws of vertebrate animals. No invertebrate animals have true teeth because their skeletons (when they have a skeleton) do not consist of bone. Among the vertebrate animals no living birds possess teeth of any kind, although some kinds of extinct birds had them. Fish, amphibians, and reptiles often have teeth, but these are nearly always all of the same kind in any one species, and they are simple – each tooth consisting of a single knob or sharp point.

It is only among the mammals that we find complicated and differentiated teeth. By 'differentiated' we mean that the teeth are of several different kinds in the jaws of the same animal, and that they serve different purposes. You can see this by considering your own teeth; the front ones are suitable for biting off pieces of food and the back ones for chewing them up. In many other mammals the differentiation is much more obvious.

A single scheme of classification can be applied to nearly all mammals' teeth. In the front are the incisors or 'biting off' teeth; behind them, in each jaw, comes a single pair of long canine or 'fighting' teeth; behind these again are the premolars and molars, which are generally used for chewing, though in some carnivorous (flesh-eating) mammals they are used for slicing up the food.

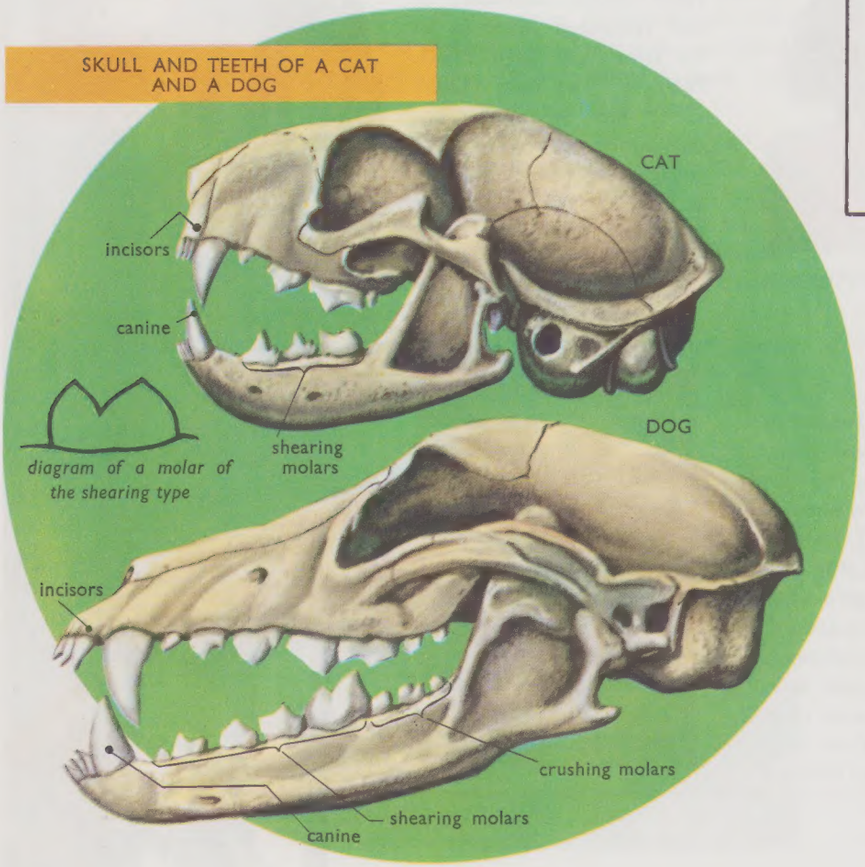
SKULL AND TEETH OF A PIG



THE TEETH OF OMNIVOROUS MAMMALS

The word *omnivorous* means 'eating everything', and the pig is a typical omnivorous animal. In the front of a pig's jaws are the incisor teeth. Behind them are the canine teeth; these may be enlarged to form tusks, which are formidable weapons for fighting. The lower canines are the most developed in this way. The pig's molars are of a type suitable for mashing up any kind of food, either vegetable (roots and stems) or meat. Man is also omnivorous, and our teeth are rather similar in type, except that our canines are small.

SKULL AND TEETH OF A CAT AND A DOG



THE TEETH OF CARNIVOROUS MAMMALS

The cat and dog are typical *carnivorous* or flesh-eating animals. Their incisor teeth are small, but the canines are long and sharp and overlap when the jaws are closed; they are weapons for seizing and killing the animals' prey. In both the cat and dog the molars nearer the front of the jaw are sharp-edged and shear against one another like the blades of scissors; they are used for cutting up the flesh when the animal is eating, and enable it to bite off pieces small enough to swallow.

The cat has one very small, almost useless, molar in each jaw behind its shearing molars. The dog, however, has two small molar teeth behind the large shearing ones, and these are used for crushing food. This is because the cat is more purely carnivorous than the dog, especially in the wild state.

THREE BASIC TYPES OF TEETH

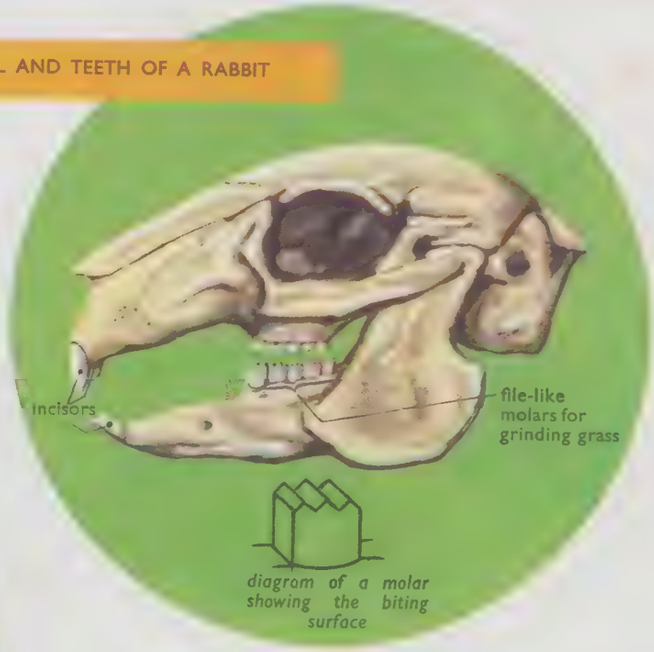
As we have said, there are three types of teeth in mammals.
The *incisor teeth* are in the front of the jaw and are used for biting off pieces of food.
The *canine teeth* are long and sharp and are used as weapons.
The teeth behind the canines are the *premolars* and *molars*. These have the same function, but the premolars, which come in front of the molars, are preceded by baby- or milk-teeth in the young animal, while the molars are not.

TEETH OF HERBIVOROUS MAMMALS

We can take the ox and the horse as typical *herbivorous* animals, which live on grass and leaves. The first thing we notice is that they have no canines; instead there is a wide gap between the incisors and the molars. The horse has incisors in both upper and lower jaws, but the ox has them only in the lower jaw; at the front of the upper jaw there is a hard pad. The horse cuts off the grass that it eats, while the ox tears it off. The molars of both are flattened and provided with a ridged surface for grinding up vegetable food.

SKULL AND TEETH OF AN OX AND A HORSE

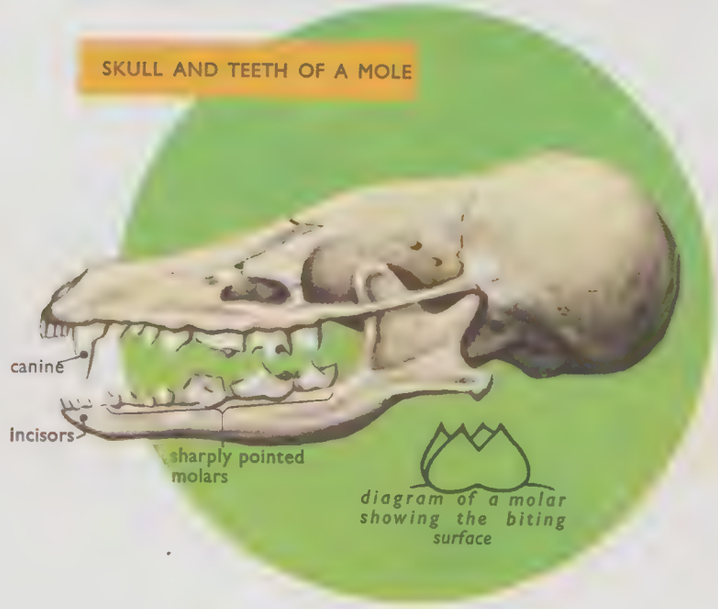
SKULL AND TEETH OF A RABBIT



THE TEETH OF RODENTS

Rats, mice, and beavers are rodents; and although rabbits are not rodents but lagomorphs, their teeth are so similar that we will consider the two groups together. These animals are herbivorous and have sharp incisors, which continue to grow throughout their life. The molars have surfaces like files for rasping and grinding vegetable food, and there are no canines. There is a very long gap between incisors and molars.

SKULL AND TEETH OF A MOLE



THE TEETH OF INSECTIVOROUS MAMMALS

The mole, shrew, and hedgehog are *insectivorous*; they feed mainly on insects. They have a large number of teeth, and all types are present. The mole has 44 teeth – 12 incisors, 4 canines, and 28 molars. All of them are sharply pointed, and are used for seizing and crushing up the insects on which these animals prey.

The teeth of the insectivores are primitive; that is, they resemble those of the early ancestors of all the mammals.

THE TOUAREG

FEW Europeans have ever met the Touareg, but travellers who do come across them recognise them at once, for all Touareg men wear a special veil which covers the mouth and leaves only the eyes free. The Touareg boy knows that he is accepted as a man when he is allowed to wear the veil, which the Touareg call a *litham*. Once he wears the litham, he never removes it except that when eating he lifts it slightly with his hand. Because of this strange custom the Touareg are sometimes called 'The People of the Veil'.

The Touareg are a nomadic people, wandering on their camels through one of the most inhospitable areas on this planet, the great Sahara Desert in North Africa. They are expert camel men, and those who live in the southern desert are great horsemen. Once the Touareg were in command of the ancient camel caravan route which stretched from the eastern edge of the Sahara down to Lake Chad, and they were greatly feared by the other races of the desert. Even today they will occasionally raid other tribes for their possessions.

A Touareg noble dressed in his flowing robes and litham, which protect him from the desert sun, sand, and winds

The tent of a well-to-do Touareg, made of animal hides.

OTHER TRIBES OF THE DESERT

The first inhabitants of the Sahara were Negroes, Berbers, and Arabs. Although each of these groups successively dominated the desert they gradually became mixed, and the three great ethnic groups inhabiting it today emerged. These are the Touareg, the Tibbu, and the Moors. The Tibbu, who live in the eastern Sahara, are very like the Touareg, although they have mixed closely with negroid races. The Moors of the western Sahara are a pure white race and mostly nomadic; they are orthodox Muslims.

BANDITRY AND TRADE

However, the Touareg are not indiscriminate bandits, attacking every caravan – they will only attack those with whose owners they have a quarrel. If they pass a peaceful caravan on the way to a raid, they will leave it alone.

Although the Touareg now earn their living mainly by trading in salt, dates, and grain, they still cherish their ancient weapons such as their large metal lances, double-edged swords like those of the Crusaders, and their great hide shields. Indeed, their code of chivalry is like that of the knights of the Middle Ages. They can always be relied on to repay a debt, and a Touareg's word can be depended upon. A Touareg proverb says: 'Hell itself abhors dishonour.'

The Touareg are mainly found in an area which is roughly a triangle with its points at Timbuctoo, Lake Chad, and Gadames at the southern tip of Tunisia. They are ethnically (by race) related to

the Berbers of the Atlas Mountains. Their skins are tanned but not black. They are a tall people, slender and graceful in movement. Their hair is dark and straight, and some of them have blue eyes.

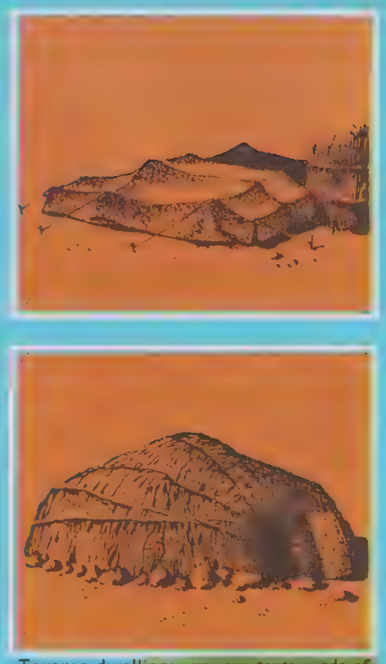
TOUAREG CHILDREN

The Touareg children are well brought up and have charming manners. When they are very small, their mothers wash them frequently with soap and water. But as they grow bigger they learn to clean themselves with dry sand like their elders. This is necessary because water is very precious and often scarce in the desert. In spite of this the Touareg always manage to look clean, but there are strange patches of blue on the skin of both men and women; these come from the home-made dye of the garments which they wear, which are usually of indigo blue. The women wear a long piece of indigo cloth wrapped round the body to form a skirt. Over this they wear something that looks like a sleeveless coat, but is in fact a square of cloth with a hole in the centre for the head. Over this they may wear another piece of cloth as a cloak. You will see from this that little sewing is required to make these garments, and indeed the Touareg women are not as a rule clever with the needle. But they do

Many Touareg women are good musicians. Their favourite instrument is a kind of violin called an amzed, which has only one string. Young girls get together and give parties, at which they not only play music but make up poems which they recite.

OVERLORDS AND BONDSMEN

Because they are a desert people, most of the Touareg live in tents, though some live in huts. Each group of Touareg is ruled by an overlord who has his court of nobles. There are also a number of bondsmen who owe allegiance to their overlords in return for their protection. Many bondsmen are darker than the nobles, because their ancestors married Negroes.



Touareg dwellings; upper: *tents made of hides*; lower: *hut reinforced with stones*

The man on the left is a smith working at his anvil. Behind the man on the right is a camel saddle

decorative leather work. They are fond of jewellery, and they have their own special form of make-up. They use a powder of ochre which they say helps to keep away the desert flies. They dye their fingers and toes with henna.

HOW THEY LIVE

Like most of the people of North Africa, the Touareg are Muslims, though some of their ideas differ from those of other Muslim people. For instance, Touareg women have just the same rights as men and are regarded as their equals, and unlike most Muslim women they are not veiled.

Writing and music: The Touareg have their own ancient alphabet which has been put together from writings used in ancient Carthage. It can be written from left to right, like our alphabet, or from right to left, like Arabic, or vertically, like Chinese writing.

THE LARGEST DESERT IN THE WORLD

The name Sahara comes from the Arabic word *sahra* which means wilderness. This desert stretches right across Africa from the Atlantic coast to the Red Sea. Its total area is about 3,500,000 square miles, and it covers over a quarter of the great African continent. Although it is one desert, it is owned by different countries. The Sahara is by no means completely barren, although the vegetation is poor everywhere except in the oases which occur wherever water can be obtained. A network of ancient caravan routes links these oases.

THE ORIGIN OF PLAINS

The distribution of the main plain lands of the world

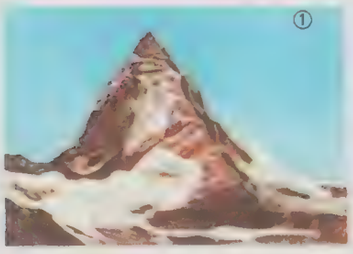
THE surface of the world is extremely varied. One of the simplest classifications used to describe these differences divides land-forms into plains, plateaux, hills, and mountains. It is not always easy to separate these zones exactly, as they often merge gradually into one another, but this classification is useful as a rough guide.

Plains make up about 36 per cent of the land surface of the world. They are relatively smooth areas, which have gentle slopes and have only small differences in altitude in any one area. Plains are by no means all alike; some have rolling or even rough surfaces, while others are nearly flat. Some plains may rise gently inland and, because of their great extent, reach considerable heights, while others are at lower levels and may even lie, behind ranges of hills, below sea level.

These differences are generally caused by the different ways in which the plains were originally formed.

The plains of the world have obvious advantages for the people who live on them. Their low relief and gentle slopes make building, cultivation, and transport relatively easy. Indeed, many of the great plains of the world are densely populated, but this is not altogether due to their form. Other factors have influenced people settling on them, including their climate, the fertility of their soil, and the history of the area. All these different things mean that while some plains are intensively used by man, others, including the cold tundra plains of the Arctic, are used very little.

Plains can originate in many ways, but it is generally believed that even mountain lands will become plains by the wearing down of the land, if this process takes place for a sufficiently long time. Young mountain lands are characterised by steep slopes and considerable differences of height between the valley floors and the mountain tops. When a mountain area has been worn down, the slopes become less steep and the relief less extreme, while an area that has been subjected to long continued downwearing becomes almost a plain, and is characterised by gentle undulations and slopes.



① *A peak standing high in a typical young mountain range*

② *An older mountain landscape; the sharp outlines of the young mountains have been worn away*

③ *An undulating plain; many centuries have worn the original mountains down to gentle rises*

But how can mountain areas be worn down to become gently undulating plains? This process, which may take many hundreds of thousands of years, is caused by the action of rivers and the weather.

In steep mountain areas rivers flow swiftly down the slopes, cutting far into the sides of the mountains. If this river erosion was the only erosion process, deep, vertical-sided trenches would be produced, but the normal processes of weathering break down the sides of such trenches and turn them into valleys.

We have already seen how weathering can alter the shapes of mountains, breaking up or dissolving the rocks (see page 146). The broken-up rock material moves in time down the sides of the mountain. The scree slopes which are often found on mountain sides are accumulations of broken-off pieces of rock which have fallen down the slope, and are moving towards the floor of the valley below.

If the broken rocks from the sides of the mountains and valleys merely collected in the bottoms of the valleys they would soon be choked up. In fact, the rocks are carried away by rivers and deposited ultimately in the sea. Rivers are continuously moving rock debris from the land towards the oceans, and it is this constant export of rock from the highlands that eventually leads to their lowering and conversion to plains.

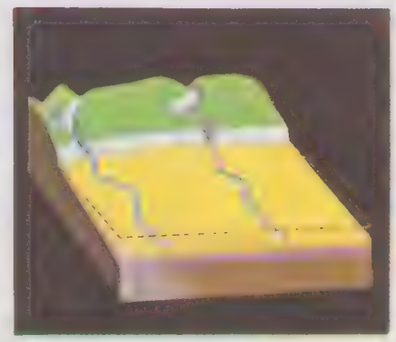
Three stages in the life of a valley showing how it is worn deeper, and wider, while its sides retreat and become less steep by the processes described

From the sea to a plain

The formation of a delta plain by a river depositing debris into quiet sea waters

Some plains lie in places which were once part of the sea. They may develop in several ways. One of them, illustrated above, is by the extension of the land. When a river carries a load of debris into rather quiet waters, it may deposit this material at its mouth. In time the deposit of debris may build up into an extension of the land; this is called a *delta*. When delta lands are drained they often form very valuable agricultural land – an outstanding example of this is the Nile delta.

The diagrams on the right show how another type of plain replaces sea. (Above) Waves have built up the sea bed by depositing material, eroded from the shore. If the sea retreats, or if the land is thrust up by movements within the earth, the sea bed will be exposed as a plain (below).



The formation of a plain by the emergence of the land from the sea

Inland plains

The formation of an ox-bow lake in a valley plain

Inland plains are usually formed by the action of rivers. In the diagrams at the bottom of the page you can see how a river widens its valley by eating into the hills where its course swings against the valley side. In time this will lead to the development of a flat valley plain, and if the tributaries of the main river develop valley plains in the same way, the final result may be an extensive plain.

Rivers may also form inland plains by depositing material to fill up hollows in the landscape. The diagram below shows one type of alluvial plain, formed by rivers flowing down from the surrounding mountains into an enclosed basin. The load of debris the rivers were carrying has filled up the floor of the basin to give an inland basin plain.

The development of a plain by rivers filling up a basin between mountains

You might well imagine from what we have said that the whole world will eventually become a series of enormous plains. But this is extremely unlikely, because conditions never remain the same long enough for this to happen. Forces acting from within the earth heave up its surface, forming the high uplifted plains known as plateaux, and new mountain chains.

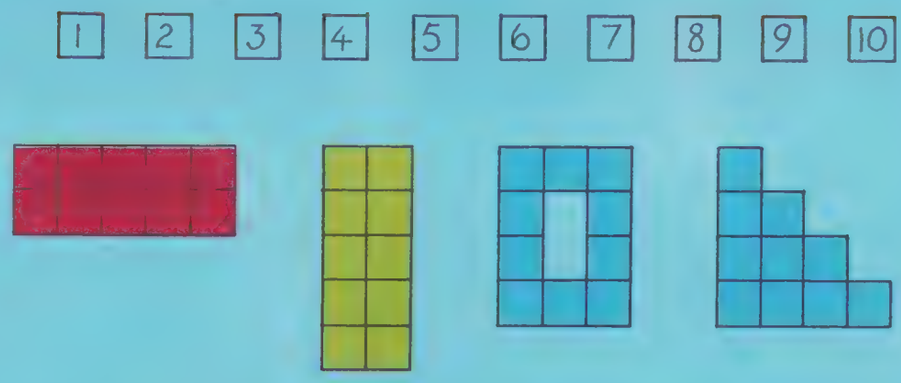
Confluent rivers meet in a wide valley plain

NUMBER PATTERNS

TRIANGULAR NUMBERS

COULD you find the sum of the numbers from 1 to 100 very quickly? Try to do so before reading any further.

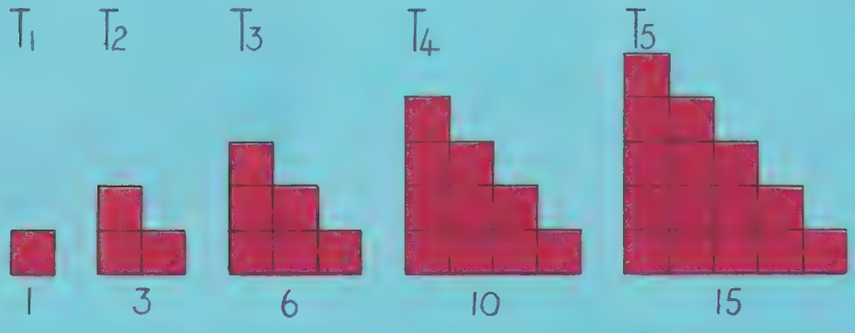
We are going to see how an appreciation of the pattern of numbers would help to solve a problem of this type.



If you were given ten small squares you could arrange them into various patterns, some of which are illustrated.

The fourth pattern is triangular shaped, and any number which has the property of being represented by a triangular pattern is called a TRIANGULAR NUMBER.

We will call the first triangular number T_1, the second T_2 and so on. We call 1 a triangular number because it is the basis of the triangular numbers. Here are the first five triangular numbers:



We notice that $T_1 = 1$
$T_2 = 1 + 2$
$T_3 = 1 + 2 + 3$
$T_4 = 1 + 2 + 3 + 4$

You will remember that our original problem was to find T_{100}.

Now if we take two of our T_5 shapes, they can be rearranged to form a rectangle.

So two T_5's $= 5 \times 6$

$$T_5 = \frac{5 \times 6}{2}$$

Similarly $T_6 = \frac{6 \times 7}{2}$

(try for yourself)

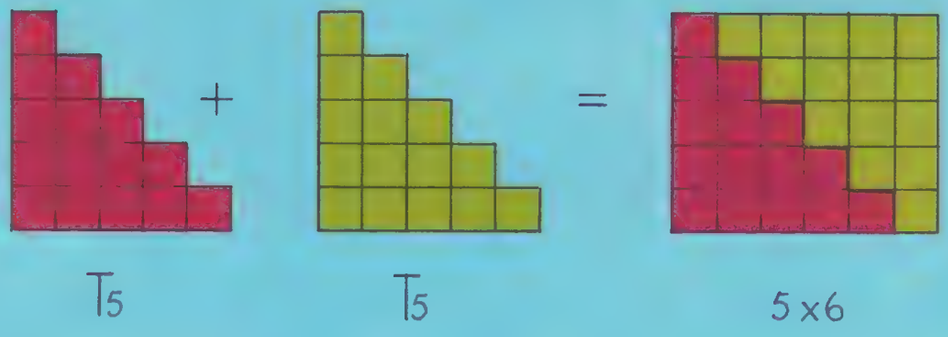
Consequently $T_{100} = \frac{100 \times 101}{2}$

$= 50 \times 101$

$= 5050$

and here is the answer to our original problem.

Now try to find the sum of the numbers from 1 to 1000.



It is interesting to note that any number can be expressed as the sum of three or fewer triangular numbers.

For instance, $14 = 10 + 3 + 1$, $12 = 10 + 1 + 1$, $30 = 21 + 3 + 6$. Try some more examples for yourself.

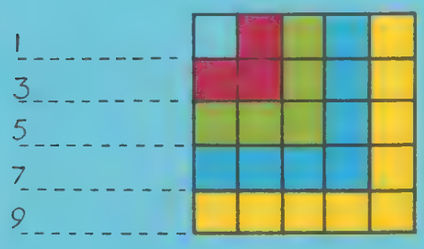
SQUARE NUMBERS

The numbers shown have a related square form and they are consequently called SQUARE NUMBERS. This is also why a statement such as $16 = 4^2$ is read as 'Sixteen equals four squared'. Can you see why $27 = 3^3$ is read as 'Twenty-seven equals three cubed'?

Now let us try adding sequences of odd numbers:

$$1 + 3 = 4$$
$$1 + 3 + 5 = 9$$
$$1 + 3 + 5 + 7 = 16$$
$$1 + 3 + 5 + 7 + 9 = 25$$

The answer is always a SQUARE NUMBER, and the diagram below explains why.



$1 + 3 + 5 + 7 + 9 = 25$

Check on some further sequences.

1 4 9 16 25 etc:

TRIANGULAR NUMBERS AND SQUARE NUMBERS

Here are the triangular numbers again: T_1 T_2 T_3 T_4 T_5 T_6

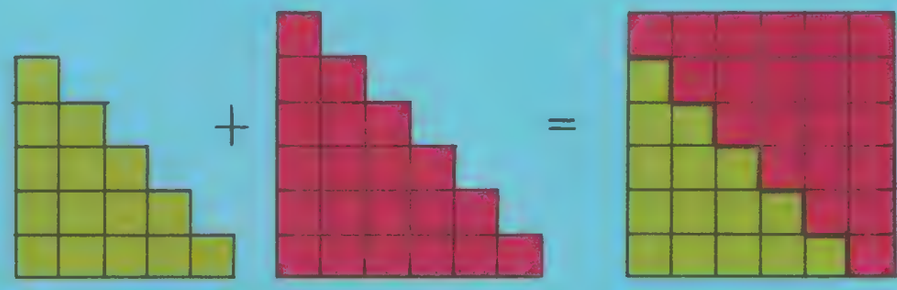
1 3 6 10 15 21

There is a simple connection between the triangular numbers and square numbers. Do you notice it? The sum of successive triangular numbers is a square number.

$$1 + 3 = 4$$
$$3 + 6 = 9$$
$$6 + 10 = 16$$

and so on.

Again the diagram explains why.



$T_5 = 15$ $T_6 = 21$ $T_5 + T_6 = 36$

MULTIPLICATION TABLES

The multiplication tables, as well as the individual numbers, have their own associated geometrical shape.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

In this diagram the multiples of nine have been shaded in, resulting in a straight-line pattern. Do you see why? What else can be noticed about these numbers: 9, 18, 27, 36, 45, 54, 63, 72, 81?

(i) The sum of the digits in each multiple is 9.
(ii) The 10's digits increase 1 at a time and always 1 less than the multiplier.
(iii) The units digits decrease 1 at a time.

Could you formulate a rule for multiplying nines by any digit?

There are many number patterns involving the number nine, e g:

$$1 \times 9 + 2 = 11$$
$$12 \times 9 + 3 = 111$$
$$123 \times 9 + 4 = 1111$$
etc
$$9 \times 9 + 7 = 88$$
$$98 \times 9 + 6 = 888$$
$$987 \times 9 + 5 = 8888$$
etc

Try to explain why these number patterns occur.

Construct the other multiplication table patterns on squares marked 1 to 100 and see what other number properties you can discover.

JOHN CALVIN

THE two greatest figures of the Protestant Reformation were Martin Luther (see page 1248) and John Calvin. Luther's teaching was the basis of the 16th-century Reformation. Calvin provided a body of doctrine that was to lead the Reformation to a complete break with tradition. Luther made an attack on the abuses and some of the doctrines of the Catholic Church, but Calvin condemned the organisation on which that Church depended. At the age of 26 – in a book called the *Institutes of the Christian Religion* – he wrote a complete system of theology, expressing views which he hardly changed during the rest of his life and which was to have a tremendous effect on the religious thinking of Europe.

The young French lawyer

John Calvin was born at Noyon, in north-east France, on 10th July 1509. His father was a lawyer and his mother the daughter of an innkeeper. Like many ambitious families of the time, the Calvins sent their son away to be brought up in a noble household, intending that he should become a priest in the Roman Church. In 1523 he went to Paris to continue his education, attending a school which, at different times, had among its pupils two other great religious thinkers, Erasmus and Ignatius Loyola (see page 801).

But Calvin never became a Catholic priest. At the age of about 20 he left Paris to study law. But his critical mind was already questioning the doctrines of the Catholic Church.

In 1517 Luther had pinned up his 95 Theses on the door of a church in Wittenberg, and ever since then his ideas were being excitedly discussed throughout Europe. Calvin's criticisms of the Church were even stronger than Luther's. By 1530 he was openly disputing much Catholic doctrine and was spending hours studying the New Testament in the original Greek. The French Church and the government could not stand by while men like Calvin struck at so much that they believed, but the French king, Francis I, was forced to move rather carefully as his alliance with some of the Lutheran princes of Germany was important to him. But soon there were so many charges against Calvin that he had to leave France and settle in Switzerland, first in Basle and then in Geneva, the city where he was to spend the rest of his life and with which he was to link his name so firmly.

By the 1540s men were flocking from all over Europe to visit Calvin, to study with him, and above all to see the kind of Church he was organising there with the often reluctant help of the city magistrates. From Geneva this Frenchman began to influence the world at large, but his work and his ideas were all based on the great book he had written before he finally left France.

A great book

The *Institutes of the Christian Religion* appeared, in Latin, in 1535. It gave Calvin's views on what the Christian faith was, and on what the Christian Church should be like.

God, said Calvin, is Lord of the universe, all-powerful and totally good. Man without the help of God is totally evil and depraved. But God *does* help man and so enables him to break the bonds of his sin and be saved. God does it through the sacrifice of Christ on the Cross, and the goodness of God flows through Christ to men. But men cannot help themselves through their own efforts. They must wait for God to act upon them – and when this happens they *know* they are saved.

God has, in fact, already decided who is to be saved and who is to be damned. This is the famous Calvinist doctrine of predestination. But when this feeling of personal salvation comes to an individual man, it comes in the form of faith – faith that the individual has been raised from sin to Life. Those without such faith can only pray that one day they may be among the chosen. The followers of Calvin, for the most part, *did* feel this faith in their own salvation, but this did not give them the freedom to live how they liked, as some enemies of Calvin suggested it might. For Calvin made it clear that the outward evidence of such faith was in a man's whole life. The society which Calvin organised at Geneva was terrifyingly strict in its punishment of wrongdoers, making little or no distinction between sin against God and crime against the civil law.

Since man was saved by the direct operation of God, Calvin could see no need for the professional priesthood of the Roman Catholic Church. The Church Calvin outlined in the *Institutes* and established in Geneva had no ordained priests and no bishops, its officers being elected by the faithful.

Calvinism spreads

Some historians have called Geneva the 'power-house of the Reformation'. Those who visited it went back to their own countries armed with a body of perfectly argued doctrines and with a blue-print for Church organisation. Calvinism found most support in the British Isles among the Scots. The Church of Scotland to this day is largely Calvinist in belief, though the harshness of much of Calvin's thought has been softened.

The Calvinists in France were called the Huguenots, those in Scotland Presbyterians, and many of the Protestants of the Netherlands were also Calvinist. As a result of persecution many European Calvinists emigrated to America in the 17th and 18th centuries.

John Calvin died quietly in Geneva on 27th May 1564, and was buried simply in a public cemetery.

INSECTICIDES

TWO thousand miles of locusts! That is the estimated length of the largest of the colossal swarms of these voracious insects which devour every scrap of vegetation lying in their path. A plague of locusts is a constant threat to the inhabitants of some arid regions to whom it can mean destruction of their crops and famine. A swarm can weigh many thousands of tons and eat as much food as the 8 million inhabitants of London.

The insect population of the world is vast. A million may be living on a single acre of British soil at certain times of the year. Some, like bees, which pollinate flowers, are useful to man, but many more are harmful. They eat his crops, infect him or his animals with disease, and ruin stored foodstuffs.

The terrible plague known as the Black Death which swept Asia and Europe between 1345 and 1350, and which killed perhaps one-third of the population of England, was caused by a certain type of flea which carried the plague bacillus from infected rats to humans.

In 1955 the World Health Organisation stated that 50 per cent of all human deaths in the world were caused by diseases carried by insects.

But insects do not only cause damage to health. Damage to food which is stored in barns, granaries, and warehouses is also extensive. In 1952 it was estimated that insect pests ruined stored food worth £1,333 million in the United States alone! In the tropics termites can destroy wooden buildings in a matter of hours, and even in Britain woodworm can cause much damage.

A helicopter spraying a field with a modern synthetic insecticide. Large areas of agricultural land, especially in the U S A, are now treated from the air, but care has to be taken that the spray (or dust) does not drift with the wind on to other fields where it is not wanted

Man has waged a constant battle against insects. In books written thousands of years ago we find recipes for mixtures which were supposed to kill or repel insects, but not until very recently has man had really effective weapons with which to tackle the teeming millions of this destructive enemy.

The earliest insecticides (insect-killer; 'cide' is derived from the Latin *cecidi*, I have killed) were naturally-occurring vegetable products. Nicotine from the tobacco plant, derris made from the roots of a tropical shrub, and pyrethrin from a species of chrysanthemum were the three main insecticides used before the end of the Second World War. A few poisonous compounds of arsenic and one of copper, which were used mainly on farms, completed the list of materials which had any real effect on the majority of insect pests.

The first modern synthetic insecticide, called D D T from the initial letters of its chemical name (*Dichloro-diphenyl-trichloro-ethane*), had been known to science for over 50 years before its insecticidal properties were discovered in 1939. After lengthy experiments it was used for the first time in Italy, towards the end of the Second World War, to check an outbreak of typhus.

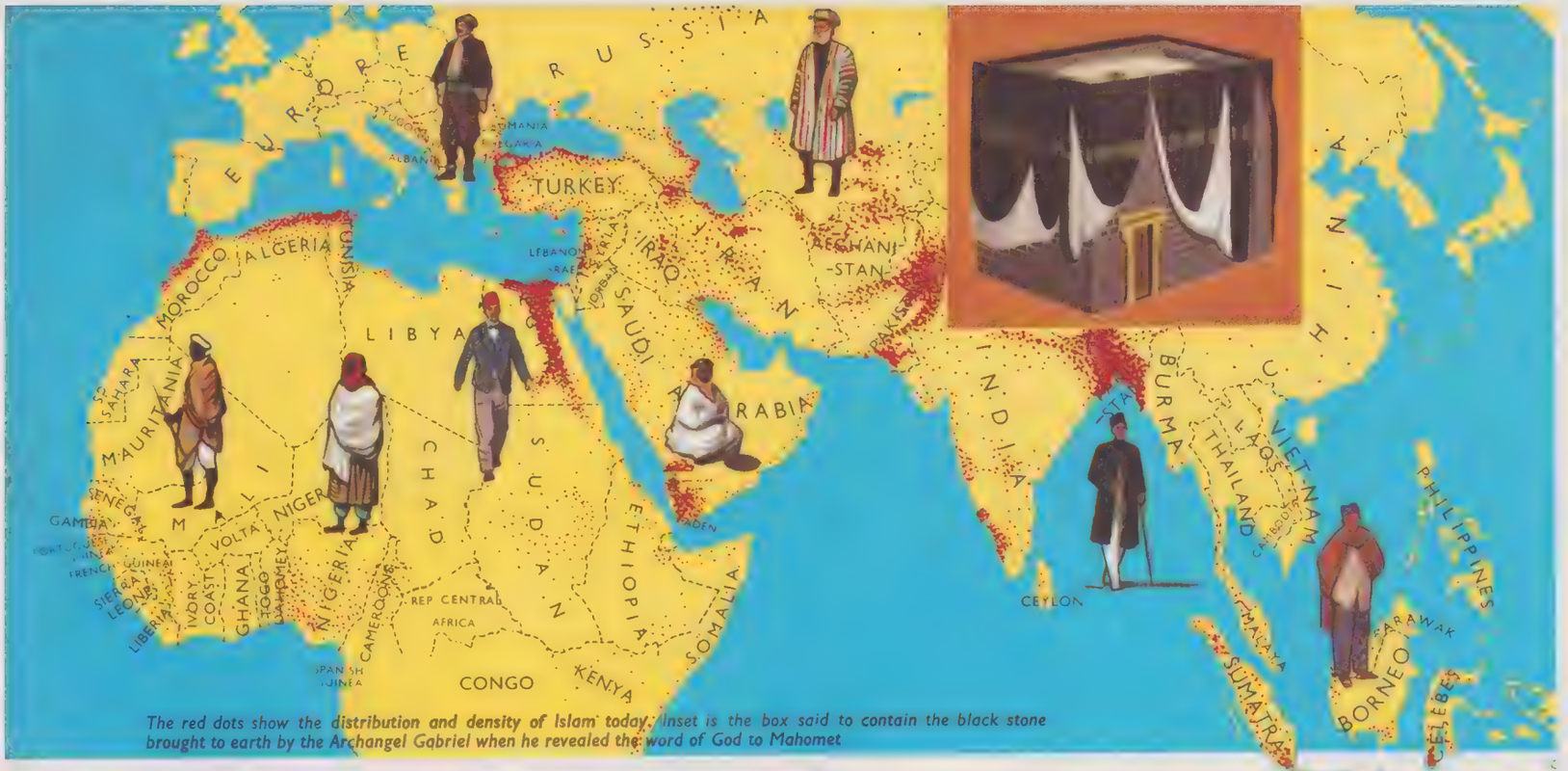
D D T is one of a class of insecticides known as *chlorinated hydrocarbons*, and in 1942 a second member of this class, B H C or Gammexane, was discovered. Since then many other chlorinated hydrocarbon insecticides have been discovered, and Dieldrin and Aldrin are among the most widely used.

At about the same time that D D T and B H C were being developed, the first member of another important group of insecticides was discovered. These are the *organo-phosphorous* insecticides. Chemically they are similar to some materials which were produced during the war as possible poison gases. The phosphorous insecticides are extremely effective, but some are more poisonous to man and animals and so have to be used with great care. They are extremely useful in agriculture, since some of them are absorbed by the plants on to which they are sprayed and enter the sap. When a plant-feeding insect such as a greenfly sucks the sap of a treated plant, it is poisoned by the insecticide in it. Insecticides of this sort, called *systemic insecticides*, are absorbed from the surface of treated plants, and are less dangerous to pollinating insects like butterflies and bees than the chlorinated hydrocarbons, which remain for long periods on the surface of leaves and stems.

When it is necessary to wipe out an infestation of insects in a building, and control insects which enter it from outside, it is essential to use an insecticide which is not harmful to people who may live or work in the building, and which will also last for a long time. In this case certain chlorinated hydrocarbons are the best type to use.

A natural insecticide which is still widely used is pyrethrin. It is obtained from the flowers of a type of pyrethrum plant which grows in Kenya and the Far East, and one of its advantages is that it acts rapidly. For this reason it is widely used in aerosol sprays when the housewife wants to see an immediate effect from her spraying. Pyrethrin does not have any lasting properties since it quickly decomposes when exposed to air or light.

In many parts of the world some species of insects have become resistant to certain insecticides, and are no longer killed by them. This problem of resistance is a serious one, and many scientists are working on methods of overcoming it.



The red dots show the distribution and density of Islam today. Inset is the box said to contain the black stone brought to earth by the Archangel Gabriel when he revealed the word of God to Mahomet

THE RELIGION OF MAHOMET

ISLAM (the word means submission) developed in the 7th century A D among the nomadic (wandering) tribes and townspeople of the Arabian desert, and spread with the Arabs as they conquered North Africa, Syria, and even Spain.

The prophet

The founder of this world-changing religion was Mahomet (Mohammed or Muhammad). He was born probably in 570 and he died in 632. In this short time he provided a single religion for many desert wanderers who had previously worshipped the sun and the moon, or the rocks and the sand, and inspired them to conquer the rich lands beyond the desert.

His followers record him as being tall and thin, with wide soulful eyes and flowing black hair. He was orphaned at an early age and lived with a poor family whose hardships he shared. His austere habits are reflected in the religion he founded, which to this day forbids the eating of pork and the drinking of wine.

At the age of 20 Mahomet married the first of his dozen or so wives, a rich widow named Kadijah. This gave him a position of some importance in Mecca, and in 611 he is said to have had the first revelation from God that he was to found a new faith.

His passionate intensity and belief in his calling communicated itself to those who heard him. He taught that there was but one God (Allah) who was all-powerful and whose Will, as revealed by the prophets, must be obeyed implicitly and with complete submission. Mahomet did not reject the entire teaching of the Christian Church, but he did deny the Divinity of Christ. He maintained that there were 28 prophets of the true Messiah, among whom were Adam, Abraham, and Christ, but that the whole truth had only been revealed to himself, Mahomet.

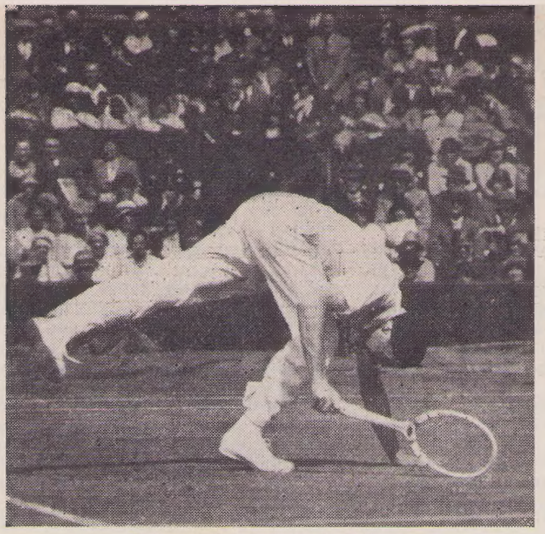
His teaching brought violent opposition in Mecca from those who were committed to the old ways, and in 622 he was forced to flee to the town of Medina, where he made converts on a vast scale and enjoyed a success he had never known in Mecca. This year, 622, is the most significant one in the Islamic faith, and the Muslim calendar dates from it, as the Christian calendar dates from the birth of Christ.

In 630 Mecca, the traditional Holy City of Arabia, was re-entered and conquered by Mahomet and his followers. Two years later he was dead and his religion had not yet spread outside Arabia. But under the succeeding Caliphs (the word caliph means successor to the prophet) Islam moved far beyond the Arabian border. With this expansion it gradually lost its Arabian character, and the seat of the caliphs moved first to Damascus and then to Baghdad.

The Koran

During his life Mahomet's utterances were recorded by his followers. He used to go into trances, after which he would reveal the 'word of God' that had been entrusted to him. By 650 these utterances had been collected into a book, the sacred book of Islam called the Koran. This book has probably been more widely read than any other that has ever been written.

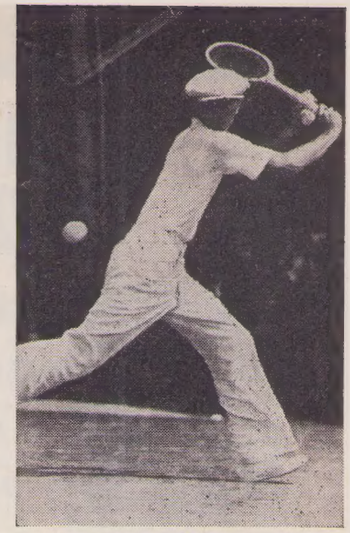
The Koran lays down certain duties for all true believers. First, there is the confession of faith that there is no God but Allah, and that Mahomet is his prophet. Secondly, the orthodox Muslim must pray five times a day wherever he may be. His prayer consists of a recitation of passages from the Koran, and while he prays the Muslim must face in the direction of Mecca. Before praying the believer must wash himself in water or sand. The third duty is the giving of alms, and the fourth is a fast lasting throughout the month of Ramadan (one of the Muslim's calendar months), when the Muslim must not eat, drink, use perfumes, or approach a woman, from dawn to twilight. The fifth and final duty is the great pilgrimage to the Holy City of Mecca. All believers have to make this once in their lives, if humanly possible. This provides a strong and valuable bond between the members of a creed which has spread far beyond the confines of one country to become one of the great religions of the world.



Borotra – the acrobatic Frenchman

GIANTS of Wimbledon

The excitement of this year's Wimbledon has died down and there is a new Wimbledon champion. But Wimbledon today no longer has any claims to be the championship of the world since all the best players have become professional and are barred from entering – Hoad, Rosewall, Trabert, Sedgman, Gonzales, Cooper, Anderson, Laver could beat any of today's amateurs – but in its hey-day Wimbledon attracted the finest players the world has ever seen. Let us meet some of them . . .



Vines – the hard-hitting American

IT seemed all over. Bill Tilden, the greatest player of all time, was crushing his French opponent Henri Cochet in their 1927 Wimbledon semi-final. Tilden's murderous drives and cannonball service took him to 6–2, 6–4, 5–1, and with two match points he had as good as won. But suddenly something happened. Tilden's vicious strokes started coming back to him, and now it was the American who was in trouble, as Cochet amazingly won the next 17 points with dazzling tennis. Nothing could stop Cochet, and he eventually emerged the victor from the most drama-filled match ever witnessed at Wimbledon.

Seven years earlier Tilden had first taken Wimbledon by storm, and won the title at his first attempt. Everything about Tilden was dashing and daring. Tall, handsome, rangy, he was not only a tennis player but an actor, author, playwright, producer, bridge fanatic, and music lover. He was a chain-smoker and a recklessly fast motorist. His tennis was devastating. He had a murderous forehand and magnificent backhand, and rarely needed to come to the net. His service was timed at 124 miles an hour. He won Wimbledon in 1920 and 1921, and his supremacy lasted until the advent of the fabulous 'three musketeers' from France – Cochet, Borotra, and Lacoste.

Where Tilden was determined, Cochet was casual and nonchalant. He would wander into the middle of the court and half-volley his opponent's blistering drives right off his toes. His forehand was said to be one of the greatest of all time, and his volleying was impeccable. Yet his backhand was at times very poor, and he had a disconcerting habit of losing the easiest of matches. Twice at Wimbledon he lost to 'unknowns' in the first and second rounds.

Cochet versus Borotra

Cochet won his first Wimbledon in 1927 when, after his amazing match against Tilden, he met the holder Borotra in another never-to-be-forgotten duel. Borotra, leaping all over the court in his characteristic way, stormed through the first two sets, but Cochet suddenly improved his backhand and levelled at two sets all. Getting his second wind, Borotra hurtled to 5–2, and had six match points before eventually succumbing to Cochet's superb tennis. It was at one of the match points that Cochet produced a volley which seemed to be a double-hit. Borotra appealed to the umpire who decided Cochet did not, in fact, hit the ball twice.

Borotra was the most spectacular player of the 1920's. He was nicknamed the 'Bounding Basque', and his famous beret endeared him to spectators as much as his daring tactics thrilled them. On wood, the fastest surface of all, he was virtually unbeatable, and on grass only Tilden and Lacoste at their very best were his masters. Borotra's tactics were simple. He would get the ball over the net, run up and volley. His speed and reactions were almost unbelievable. A ball could be slammed at him from point-blank range, and he would skip aside and crack it down for a winner. He loved volleying and smashing, and could run backwards for a lob as fast as most people can run forwards. In 1924 he won Wimbledon, and again in 1926. The crowd loved Borotra. Once he was criticised unfairly by a newspaper and immediately challenged the author of the article to a duel! In the Second World War he became Minister of Sport for the Vichy government, and as a result his Wimbledon entry in 1946 was refused. Then it was discovered that his ministry was, in fact, a centre of the Resistance Movement, and the 50-year-old Borotra competed with all his old vitality and gaiety the following year, still delighting the crowds with flashes of his former genius.

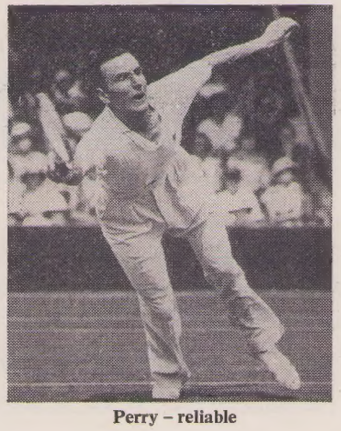
There have been many great players and many intriguing personalities at Wimbledon. There was Suzanne Lenglen, the '*prima donna* of tennis', whose tearful tantrums if she lost made every match a possible drama; and Ellsworth Vines, the American, whose first appearance at Wimbledon in 1932 caused a sensation. He had a terrific 130-mile-an-hour service and a blistering flat-hit drive both forehand and backhand, which he hit at a lethal and quite unequalled speed. Fred Perry of England was one man who mastered Vines. He hardly ever lost a match he was expected to win, and was the last Englishman to win Wimbledon, which he did for the third consecutive year in 1936.

Unpopular Falkenburg

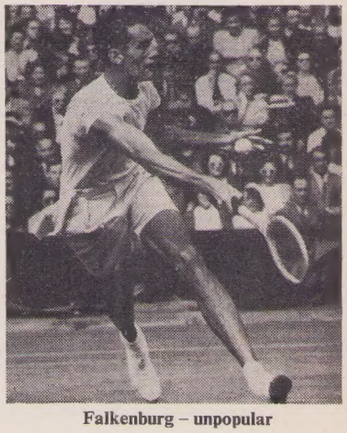
Perhaps the most unpopular of all competitors at Wimbledon was Robert Falkenburg, the 1948 champion. He would use his sensational service and smash to win two sets, and then rest for two sets, making no attempt to run, just idly swishing at the ball as it flew past him. Then in the fifth and final set he would miraculously 'recover' and beat his startled opponent with his new burst of energy.

Tilden – the greatest

Cochet – casual



Perry – reliable



Falkenburg – unpopular

Announcement for readers of Black Knowledge

AVAILABLE NOW!

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and

Still available!

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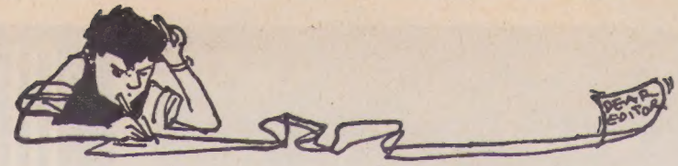
THE standard binder for Volume 12 (Nos. 133-144) is available now. See your newsagent right away.

If any Easibinder collectors have not obtained their Easibinder for Volumes 11 and 12 they can still do so.

The standard binder costs 3s. 6d. and the Easibinder 13s. 6d. If you have any difficulty in obtaining any of these binders from your newsagent write to Department B, Knowledge, 37 Hertford Street, London W.1, sending a postal order for the required sum.

There is a 1s. 3d. charge for postage and packing on all orders from this department, but more than one binder can be ordered for the same charge.



Stealing by Snake

DEAR EDITOR—I have read a number of books about diamond mining, because I am very interested in it. There are many stories about diamond smuggling. Some people used to kill snakes and then throw them over the fence into the mining area. Later, they go inside the area, and push diamonds down the throats of the snakes and toss them back over the fence, to collect later on.

There are many other ingenious methods, that make it all sound very easy.

John Broderick,
481 Marshall Street,
Johannesburg, South Africa.

Viking Custom

DEAR EDITOR—Here in Shetland we hold a Fire Festival every year known as 'Up-Helly-Aa', to celebrate a Viking chief's burial.

In days gone by, the Vikings were feared along the east coast, because they raided the coastal villages. When a Viking chief died, they put him in his longship with his weapons and belongings. The ship was pushed out to sea and then burnt.

The last Tuesday in January is the day of the festival. About three months before, a longship is built, and a Guizer Jarl (Viking chief) is elected. On the great day, squads of Vikings carrying torches march to the longship, singing the 'Up-Helly-Aa' song. When they arrive, they form a circle round the longship and sing another song. A certain man steps up and asks for three cheers for the Guizer Jarl, and 'Up-Helly-Aa'. A bugle is sounded and the torches are thrown onto the longship. In a few seconds it is a mass of flames.

There is a junior 'Up-Helly-Aa' on the same night. This year I helped to build the junior galley which was called 'Hvitdraga', meaning 'white dragon'.

Ian Johnson,
20 Russell Crescent,
Lerwick, Shetland.

I would be interested to hear about old customs that are still observed in other parts of the world.—Editor.

'Wet' . . .

What causes water on the brain? A brain wave, of course.

Roy Cole,
383 Bushbury Lane,
Bushbury, Wolverhampton.

. . . Jokes

What is the cure for water on the brain?

A tap on the head.

Neil Lewis (age 13),
33 Heaton Close,
Speke, Liverpool 24.

Colourful Collection

DEAR EDITOR—I started collecting pennants when I saw the collection of my American cousin. That was six years ago. I now have 44 pennants, all felt ones, ranging from Havana to Casablanca and Dubrovnik. Most of them I collected myself, but whenever a member of the family visits a new place, he or she always brings back another pennant.

Stuart Tattner,
10 Malford Grove,
London E.18.

Famous Dutchman

DEAR EDITOR—On the cover of *Knowledge* No. 66 you mentioned Boerhaave. He was a Dutchman, professor of Leyden University, but he taught in Vienna. There is a statue of Boerhaave outside the University Hospital in Leyden.

Henk Franken,
Oegstgeest, 't Bolschip,
Zoutkeetlaan, Holland.

New World Record

This week, the cover article of Black 'Knowledge' is about stamps. On 28th May this year a new world record was set for the highest price paid for one stamp. The unique, unused Hawaiian two cents blue 'Missionary' stamp of 1851-52 was sold for £14,600. It was one of a set of 15 'Missionaries', so called because they came mainly from the letters of missionaries. The whole set fetched £30,778.

This particular stamp was once the missing clue in a murder hunt. In 1892, its owner, Gaston Leroux, was murdered and the stamp stolen. Suspicion fell on Leroux' friend, Hector Giroux, but without the stamp nothing could be proved.

A detective disguised himself as a stamp-collector and managed to gain the confidence of Giroux. After some months, Giroux was tricked into producing the missing stamp, and finally brought to justice.

Can you answer these?

1. Australia holds the 'Ashes'. Where are they kept?
2. What counties play at the Oval, Lord's, Headingley, Old Trafford, and Edgbaston?
3. In what country is the senior cricket championship called the Sheffield Shield?
4. Can a batsman be out LBW to a leg-break?
5. Which umpire calls a 'no-ball' – the one at the bowler's end or the one at square-leg?
6. What is the difference between an over in England and one in Australia?
7. What new event is there in this season's county cricket programme in England?
8. If a wicket-keeper is injured, can a substitute wicket-keeper be introduced?
9. What is the popping-crease and why is it so called?
10. What do the letters MCC mean, and why is Lord's so called?
11. For what countries do or did these cricketers play: Patsy Hendren, Don Bradman, B. Sutcliffe, George Headley, and Arthur Mailey?

ANSWERS

1. *At Lord's cricket ground in England.*
2. *Surrey (Oval); Middlesex (Lord's); Yorkshire (Headingley); Lancashire (Old Trafford); Warwickshire (Edgbaston).*
3. *Australia.*
4. *Only if the ball pitches in a line between wicket and wicket, and would have hit the wicket if the striker's leg had not prevented this.*
5. *'No-ball' may be called by either umpire: the one at square-leg may call it for a ball thrown or incorrectly delivered.*
6. *Six balls in England, eight in Australia.*
7. *A knock-out competition, one innings each side with limited number of overs.*
8. *A substitute fieldsman may be introduced, but he may not keep wicket unless the captain of the batting side agrees to this.*
9. *It is the white-line in front of the wicket where the batsman generally makes his block-hole; so called because a 'run-out' was originally effected by the ball being popped in the block-hole, not by the wicket being broken.*
10. *Marylebone Cricket Club; from Thomas' Lord, first proprietor.*
11. *England; Australia; New Zealand; West Indies; Australia.*

BRAIN ? BOX

1. 'Bowness, Burgh-by-Sands, Carlisle, Gilsland, Greenhead, Heddon-on-the-Wall, Newcastle, Wallsend. These are the places you will find today along H—— W—— which spanned Britain from S—— to T——.'

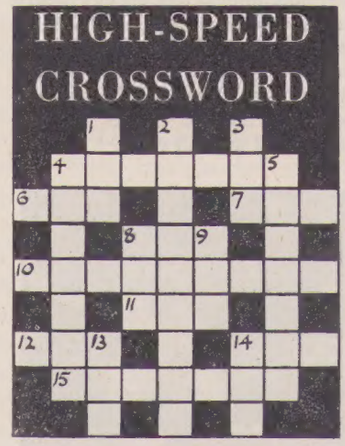
   The places are given in alphabetical order. Can you put them in actual order, west to east, and fill the gaps in the above statement?
2. ACHE; DRESS; GEAR; MASTER; QUARTERS.

   Put the same word before each of these five words to give five new words.
3. Take any number of two figures and add to it the number you get when you reverse these two figures. By what will your answer be divisible, whatever the number you chose in the first place? (Try to do this mentally.)

ANSWERS

1. *The actual order west to east is exactly the same as the alphabetical order; Hadrian's Wall; Solway; Tyne.*
2. *HEAD.*
3. *Eleven.*

HIGH-SPEED CROSSWORD



Clues Across

4. Unusual (7).
6. Master card (3).
7. Eggs (3).
8. Common conjunction (3).
10. Parts of the whole (9).
11. Metal (3).
12. Historical age (3).
14. Industrious insect (3).
15. Activity for a choir (7).

Clues Down

1. You did it last meal-time (3).
2. Colourful pictures (9).
3. I (3).
4. They record all the runs at cricket (7).
5. Close of day (7).
8. Deed (3).
9. What a noise! (3).
13. It is all round us (3).
14. Quantitative adjective (3).

Solution next week

SOLUTION TO LAST WEEK'S CROSSWORD

ACROSS: 1, Freckle; 7, Oil; 8, Trade; 9, Respected; 11, Cheer; 13, Ayr; 14, Healing. DOWN: 2, Roles; 3, *Cathedral*; 4, Lea; 5, Correct; 6, Tenders; 10, Train; 12, Exe.

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All postage and packing paid by us

The most important change made by Venice and Sardinia was to make the sender of the letter, not the recipient, pay the charges.

The start of our present-day system

In 1837 a small pamphlet entitled 'Post Office Reform: Its Importance and Practicability' was published in London.

The author of the pamphlet, Rowland Hill, made these proposals:

1. To have postal charges paid by the sender (in Britain at that time they were still at the expense of the recipient).
2. To fix a single price which would cover any distance (at that time the tariff varied in ratio to the distance).
3. To keep prices down to a minimum, so that everyone could use the postal services.

Sir Rowland Hill, the inventor of the postage stamp

Furthermore, the pamphlet suggested a completely new way of paying postal charges. It was proposed that the sender should be able to pay the cost of sending his letter by obtaining a little adhesive label to fix to the front.

These suggested reforms met with much opposition; some people objected to the principle of the proposals, while others wished to make ridiculous additions.

But Parliament, after examining the proposals, approved them in their original form. It was agreed that the adhesive labels which Hill had suggested should be printed; today we call them 'postage stamps'.

The first postage stamps

The use of postage stamps dates from 6th May 1840. That was when the stamps proposed by Rowland Hill were first placed on sale in Britain. They showed a portrait of Queen Victoria, who was reigning at that time.

Two sorts were printed, one in black, worth one penny, the other in blue, worth twopence. Some of the most famous artists of the time in England co-operated in preparing these two designs, and the result was two stamps of great artistic merit. The following figures for letters dispatched in England will give you an idea of the enormous success which Rowland Hill's reforms attained: 1839 (before the introduction of the postage stamp) – 50 million; 1840 – 170 million; 1841 – 230 million.

This new system spread quickly throughout the whole world. The first country after Great Britain to adopt the use of postage stamps was Brazil in 1843. In the same year the Swiss cantons of Geneva and Zurich also began to use stamps.

Early colonial stamps

The 1d Black – first postage stamp issued

The custom of using stamps was soon introduced into British colonies, and some of the world's most famous stamps are a result of the co-operation between British and colonial postal authorities. Thus we have the famous Cape Triangulars, which were given their shape to enable native postmen, who could not read, to distinguish between incoming and outgoing letters in the Cape Colony of South Africa; and such well-known but rare stamps as the 'Post Office' Mauritius, which was a local imitation of the Penny Black with the mistaken inscription 'Post Office' instead of 'Post Paid' (only about 20 examples of this stamp have survived); and truly beautiful stamps such as the early specimens from Ceylon and Canada.

To economise on engraving costs, the first printers used the same design for stamps from different countries. Thus 'Britannia and the Sugar Bags' was equally applicable to Barbados and Trinidad, and represented the principal product of these islands. But Barbados still further simplified stamps by omitting any values, and relying on colours to show how much they were worth. Thus the green stamps were worth a halfpenny; the blue stamps a penny; the red-brown, fourpence; the orange, sixpence; and the black, one shilling. This system lasted for 20 years, from 1853 to 1873.

St Vincent 6d

Trinidad

Cape Triangular

'Post Office' Mauritius

In 1923 the Germans issued a stamp which had the value of 50,000,000,000 marks. This is the highest nominal value of any stamp ever issued; but at the time the mark was practically worthless and 50 milliarden marks were worth only a few pence.

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The origins of philately

How soon after the invention of postage stamps did the hobby of stamp-collecting start? People seem to have become interested in stamp-collecting very quickly.

At the beginning of 1841 (a few months after the issue of the first stamps) an English newspaper published an advertisement in which someone asked for used stamps. This shows that almost immediately someone had realised what a fascinating pastime the collection of stamps could be. From the beginning prices paid for rare stamps were high, although naturally the Penny Black and the 'Post Office' Mauritius fetched nothing like the prices they do today.

Although we cannot find out exactly what kind of people made up the first stamp collections, or how many early collectors there were, it is certain that the interest in philately spread very quickly indeed.

By 1898 the number of stamp collectors in European countries was quite high. It was estimated that there were 150,000 in England; 125,000 in Germany; 70,000 in Italy; and 60,000 in France. Today, however, it is probable that the number of stamp collectors in Europe runs to several million.

A most instructive hobby

Some people still consider stamp collecting to be a useless pastime. This is because they do not realise how much stamps can teach those who collect them.

First of all, we can say that almost every stamp is a genuine work of art. Indeed, as with the first stamps to be produced, the best artists (painters, etchers, and so on) of the time often take part in the creation of a stamp. But stamps are interesting not only artistically but also historically.

Apart from portraits of heads of states and sovereigns, stamps depict many of the interesting aspects of history and civilisation of the countries which issue them.

Memorials to famous men (explorers, scientists, artists, and so on), historic events, local customs, flora and fauna, and even sporting events, are some of the things shown on the stamps of most countries. Pictures like these also help us to learn about the different countries of the world today, what their heads of state look like, and something of their social and political geography.

Philately

About a century ago the word philately did not exist; it was only invented in 1864.

The man who invented this term was a Frenchman called Herpin, who lived in Paris; he formed it out of two Greek words: *philos*, a friend, and *atelia*, franking. Franking meant placing a stamp on a letter, so the word created by Herpin means 'friend of stamps'.

And who are the friends of stamps now? Briefly, all who want to make a collection.

This stamp from French Equatorial Africa (which no longer exists under this name) shows some of the most characteristic animals of the area

A native woman is depicted on this stamp from the Cameroons, Africa

Stamp from Mozambique showing typical native fish

A Japanese stamp showing a lady in traditional costume

Canada's 10c. stamp shows the native Indian method of drying and shaping furs

Macao's stamp shows one of the characteristic flowers of South China

A stamp from the French Antarctic Region, showing Adelie penguins and a map of the territory

A pyramid and the Sphinx – Egypt's most famous monuments

The temple of Theseus (Athens) is featured on this 1927 stamp of Greece